

CLIMBING CYLINDER OF SELF-CLIMBING FORMWORK

The invention relates to climbing cylinders of self-climbing formwork which are provided for raising or lowering formwork along a wall of a building.

Self-climbing formworks are known wherein the lift cylinders are affixed to climbing rails which are moved along a wall during a climbing process.

It is the object of the invention to construct a climbing cylinder for self-climbing formwork in such a manner that it can be used and also shifted more easily on self-climbing formwork.

The object is achieved according to the invention by the features of claim 1.

Commercially available lift cylinders which operate and are embodied for example as hydraulically operating lift cylinders can be used as climbing cylinders according to the invention. The lift cylinders only need to be adapted to the invention at their respective free ends whereby at one end, a fixing connection is provided at one fixed anchor point of the wall and at the other end, a movable support is provided at the free end of the piston of the lift cylinder, which can engage in bearing bolts of the climbing rails at any points of the climbing rails. The climbing rails can carry formwork, platforms and any other bracing which can be raised or lowered with the climbing rails by means of the climbing cylinder or cylinders. The climbing rails can also be integrated in a frame unit which can receive and carry formwork in addition to other units. When a lowering or raising process has been completed by means of the climbing cylinder or cylinders, the climbing



cylinder or cylinders can be shifted to other anchor points for a new movement process of the climbing rails.

In a preferred embodiment of the invention, the climbing cylinder or cylinders are affixed to a climbing shoe or shoes which are attached to the wall in a fixed position.

This has the advantage that the climbing cylinder or cylinders can always be attached at the same fixing points of climbing shoes which are fixed to the wall at the anchor points provided. An anchor point thus bears the climbing shoe which guides the climbing rail along the wall at a defined distance and can at the same time hold the climbing rail permanently in one position. The climbing cylinder uses the climbing shoe as a fixed bearing and the climbing cylinder can raise or lower the climbing rail by means of a piston stroke.

The climbing cylinder or cylinders are placed at locating points formed on the climbing shoe or shoes. Thus, the same fixing points on the climbing shoe or shoes and the climbing cylinder or cylinders are always used for holding the climbing cylinder or cylinders on the climbing shoe or shoes. A simple structure of the climbing system can be achieved and any scope for incorrect connection to the fixed mounting of the climbing cylinders is eliminated. When the climbing cylinders are placed on the climbing shoes, the climbing cylinder or cylinders are supported on the climbing shoe or shoes during a lifting process.

An alternative embodiment of the retaining of the climbing cylinder or cylinders in the climbing shoe or shoes consists in the climbing cylinder being suspended on the climbing shoe. In this embodiment, the fixing of the climbing cylinder on the climbing shoe must be constructed so that the entire load to be raised or lowered can be taken up by the fixing connection between the climbing shoe and the climbing cylinder.

In a further embodiment, the climbing cylinder or cylinders are pivotally hinged at the fixed fixing, namely the anchor point or the climbing shoe. This has the advantage that when the piston is withdrawn into the housing of the climbing cylinder, the climbing cylinder can be pivoted out of engagement with the bearing bolts of the climbing rail, whereby when the piston retracts into the housing of the climbing cylinder, a bearing bolt impinging upon the catch of the climbing cylinder pivots the climbing cylinder to such an extent that the piston can be retracted into the housing of the climbing cylinder without any interference.

If, in this connection, the climbing cylinder is fixed in a spring-mounted manner at the anchor point and/or the climbing shoe, it can automatically pivot back into its initial position as soon as the free end of the climbing cylinder is no longer in contact with a bearing bolt.

The pivotal support of the climbing cylinder at the free end is advantageously embodied as a catch, as already stated, which can be brought into engagement with a bearing bolt of the climbing rail in a particularly simple manner. It is likewise simple to release the bearing connection between the catch and the bearing bolt by retracting the piston into the housing of the climbing cylinder. The catch is pivotally hinged to the piston and at the same time, at the support, in this case the catch, a mounting plate is provided as a counterbearing for abutment against the respective climbing rail. This has the advantage that no moments from the bearing load of the climbing rail are introduced into the piston rod when the climbing cylinder raises or lowers a climbing rail.

It is understood that the spacing of the bearing bolts at the climbing rail or rails is matched to the possible piston stroke of a climbing cylinder. The piston path of a

climbing cylinder is always longer than the spacing of adjacent bearing bolts on a climbing rail. A climbing cylinder must always be able to retract its piston rod with the catch hinged thereon to such an extent that the catch can automatically pivot into a position in which the catch can reliably grasp below a bearing bolt of the climbing rail. When a climbing process has been completed, the climbing cylinder or cylinders are moved to adjacent anchor points or climbing shoes so that another climbing process can be carried out after another concreting section has been completed. The climbing cylinder can be moved together with hydraulic hoses connected to the climbing cylinders or the climbing cylinders are uncoupled from the hydraulic hoses by means of quick connectors for the process of shifting to other fixed mounting points. After the climbing cylinder has been replaced, the hydraulic connection between the climbing cylinder and a hydraulic unit is made again.

In one exemplary embodiment the following figures show a section of a wall on which a climbing cylinder is fixed which holds a climbing rail to which various attachments can be fixed.

It is understood that the bearing bolts of the climbing rails can also be replaced by technically equivalent means. Thus, matched catches or supports of a sliding shoe can also engage in through openings on the climbing rails or projections can be constructed on the climbing rails which can be gripped or grasped from below by corresponding supports of the sliding shoe.

In the figures:

Fig. 1 shows a climbing cylinder according to the invention in side view on a wall consisting of a first and a second concreting section;

Fig. 2 shows a further side view to Fig. 1 with the climbing cylinder according to the invention in the extended state; and

Fig. 3 shows a side view with a climbing cylinder according to the invention showing how this pivots on the fixed mounting when the piston retracts.

The figures in the drawings show the climbing cylinder according to the invention and the associated parts highly schematically so that the structure and the operating mode of the climbing cylinder can be clearly shown.

Figure 1 shows a climbing cylinder 10 in the retracted state as attached to a wall 12 of a building. The figure shows sections of a first concreting section 14 and a second concreting section 16. A climbing shoe 18 is fixed on an anchor point on the first concreting section 14 in a fixed position. The climbing shoe 18 guides and holds a climbing rail 22 in position by means of a catch 20. At points of the first and/or the second concreting section 14, 16 not shown there is provided at least one further climbing shoe which together with the climbing shoe 18 shown holds the climbing rail 22 guided on the wall 12.

The catch 20 of the climbing shoe 18 can grasp under the bearing bolts 24, 24', 24", 24'" according to the position of the climbing rail 22. In the position shown in the figure the catch 20 grasps under the bolt 24' so that the climbing rail 22 is held against its gravitational force on the wall 12 so that it cannot be displaced.

The climbing cylinder 10 has a housing 26 in which a piston 28 is guided so that it can be displaced hydraulically. Hinged at the free end of the piston 28 is a catch 30 on which a mounting plate 32 is provided. The catch 30 has an

opening suitable for receiving a bearing bolt 24 to 24''. In the retracted state of the piston 28 the catch 30 is located so far under the bearing bolts 24 to 24'' that it can be pivoted without any interference into a position suitable for grasping below a bearing bolt 24 to 24''.

The climbing shoe 18 is constructed in two parts as a wall shoe 34 and sliding shoe 36. The wall shoe 34 is fixed in position at an anchor point of the wall 12 and the sliding shoe 36 is fixed in a hinged manner on the wall shoe 34. The catch 20 is pivotally mounted in the sliding shoe 36 such that it locks in the position shown in the figure and if a pressure is exerted on the opposite side of the catch which has a sloping section, the catch 20 can pivot so far into the housing of the sliding shoe 36 that it is no longer in engagement with the bearing bolts 24 to 24''.

The climbing cylinder 10 has a housing 37 by which means the climbing cylinder 10 can be placed on an articulated shaft 38 of the sliding shoe 36. When the climbing cylinder 10 is placed on the articulated shaft 38 by means of the housing 37, a safety bolt 40 secures the articulated connection and the climbing cylinder 10 can only be removed from the articulated shaft 38 by unlocking the safety bolt 40, and withdrawing it. The climbing cylinder 10 can be pivoted about the articulated shaft 38 when it is placed thereon. Between a mounting plate of the sliding shoe 36 and the housing 37 there is provided on the housing 37 a rubber or toughened element 41 which presses the climbing cylinder 10 into the position shown in the figure. If the piston 28 of the hydraulically operated climbing cylinder is extended, the catch 30 grasps under the bearing bolt 24'' and during a further extension of the piston 28, the climbing rail 22 is raised.

Figure 2 shows the climbing cylinder 10 in a fully extended position. The piston 28 is fully extended from the housing

26 and the climbing rail 22 has been raised by means of the climbing cylinder 10 in the direction of the arrow 42. The entire load of the climbing rail 22 and the associated attachments of the climbing rail 22 rest on the catch or catches 30 of the climbing cylinder 10. In the position shown in the figure, the catch 20 of the climbing shoe 18 is out of engagement with the bearing bolt 24 which during raising of the climbing rail 22 in the direction of the arrow 42, has temporarily pressed the catch 20 into the climbing shoe 18 so that the lift process could be carried out in the direction of the arrow 42 without hindrance.

Compared with the position of the climbing rail 22 in Fig. 1, the climbing rail 22 in Fig. 2 has been raised by a path length whose length is determined by the distance of the catch 20 from the bearing bolt 24'. During the lifting process the climbing cylinder 10 is supported on the articulated shaft 38 of the climbing shoe 18. By abutting against the climbing rail 22 so as to restrict the pivot path, the mounting plate 32 prevents the catch 30 from being able to pivot further under load and prevents any moments from being introduced into the piston 28 of the climbing cylinder 10 under the bearing load of the catch 30 by the climbing rail 22. The mounting plate 32 thus has the function of a counterbearing. By means of the lifting movement shown in Fig. 2, the climbing rail 22 climbs along the concreting sections 14, 16 in the direction of the arrow 42 and if the piston 28 is now retracted slightly, the bearing bolt 24 rests on the catch 20 and the climbing shoe 18 now bears the entire load of the climbing rail 22 by means of the catch 30. The catch 30 of the climbing cylinder 10 is then relieved of weight.

Figure 3 shows the climbing cylinder 10 in the non-fully-retracted state. The piston 28 is not fully retracted into the housing 26. If the climbing cylinder 10 is now retracted further compared with the state of movement of

the climbing cylinder 10 in Fig. 2, the catch 30 impinges upon its lower side, which is constructed as sloping, against the bearing bolt 24". If the piston 28 is retracted further into the housing 26, the bearing bolt 24", being held at its distance from the wall 12 by means of the spaced climbing shoe 18 so that it cannot be displaced on the climbing rail 22, presses the climbing cylinder 10 out of its alignment shown in Figs. 1 and 2 into a pivoted position as shown in Fig. 3. The climbing cylinder 10 pivots about the articulated shaft 38 so far in the direction of the wall 12 that it can completely bypass a bearing bolt, in this case the bearing bolt 24". When the climbing cylinder 10 is pivoted, the climbing cylinder 10 is pivoted from its aligned position against a spring force produced by the rubber or toughened element 41 and if the catch 30 is free from any hindrance such as the bearing bolt 24", as result of the spring force of the rubber or toughened element 41, the climbing cylinder 10 pivots back into its position free from spring loading, as shown in Figs. 1 and 2. It is shown in Fig. 3 how the safety bolt 40 secures the hinge around the articulated shaft 38 so that the housing 37 is securely held on the articulated shaft 38. The piston 28 can be retracted so far into the housing 26 that the catch 30 is automatically brought back into a position which can receive the bearing bolt 24" (a comparable position of the catch 30 as in Fig. 1). The catch 30 then comes into engagement with the bearing bolt 24" if the piston 28 is withdrawn slightly from the housing 26.

The spacings of the bearing bolts on the climbing rail 22 are matched to the piston stroke length of the climbing cylinder 10 so that the desired climbing strokes can be carried out. The climbing rail 22 also has other through openings which can be used for fixing bracings, platforms and formwork. The climbing rail itself is shown cut in the figures. The figures only show half of the climbing rail

used here which is composed of two U-profiles and joined together at a distance by means of bearing bolts.

A climbing cylinder 10 of self-climbing formwork in the building area is provided such that it can move climbing rails 22 along a wall 12. At one end the climbing cylinder 10 has a fixing for an anchor point of the wall and at the other end a catch 30 is provided on the climbing cylinder, which can be brought into engagement with the climbing rail such that it bears the climbing rail 10 on the one hand and can displace it on the other hand. The climbing cylinder 10 can be fixed at an anchor point of the building or on a climbing shoe 18.

CLAIMS

1. A climbing cylinder (10) for self-climbing formwork in the building area, wherein a climbing rail or climbing rails (22) can be moved along a wall (12) of a building by means of a climbing cylinder (10), and at one end the climbing cylinder or cylinders (10) can be detachably affixed in a fixed position to an anchor point of the building and at the other end the climbing cylinder or cylinders (10) have a support (30) communicating with the climbing cylinder or cylinders (10), which, in the retracted state of the climbing cylinder (10) runs under a bearing bolt (24, 24', 24", 24'") of the climbing rail (22) or the climbing rails (22) which are held guided on the wall (12) by means of a climbing shoe (18), and when the climbing cylinder or cylinders (10) move into the extended state, the climbing rail (22) or the climbing rails (22) move along the wall (12).
2. The climbing cylinder for self-climbing formwork according to claim 1, characterised in that the climbing cylinder or cylinders (10) are affixed to the climbing shoe or shoes (18) which are attached to the wall (12) in a fixed position.
3. The climbing cylinder for self-climbing formwork according to claim 1 or claim 2, characterised in that the climbing cylinder or cylinders (10) are placed on the climbing shoe or shoes (18).
4. The climbing cylinder for self-climbing formwork according to claim 1 or claim 2, characterised in that the climbing cylinder or cylinders (10) are suspended on the climbing shoe or shoes (18).

5. The climbing cylinder for self-climbing formwork according to any one of claims 1 to 4, characterised in that the climbing cylinder or cylinders (10) are pivotally hinged at the fixed fixing, namely the anchor points or the climbing shoes (18).
6. The climbing cylinder for self-climbing formwork according to claim 5, characterised in that the climbing cylinder or cylinders (10) can be fixed in a spring-mounted manner at the anchor point and/or the climbing shoes (18).
7. The climbing cylinder for self-climbing formwork according to any one of claims 1 to 6, characterised in that the climbing cylinder or cylinders (10) have pivoting supports at their free end which are constructed as catches (30).
8. The climbing cylinder for self-climbing formwork according to any one of claims 1 to 7, characterised in that at the support or the catch (30) a mounting plate (32) is provided as a counterbearing for abutment against the climbing rail (22).